Communication Solutions
A Rockwell Collins Business

CS-5020C

MICROWAVE RECEIVER

- ***0.5–18 GHz Coverage Standard***
- ***Low Phase Noise - 0.5° RMS typical***
- ***Search & Set-on Modes***
- ***0.1–110 GHz Coverage Available***
- ***1 GHz/500 MHz BW IF Out Standard***
- ***COMINT/ELINT (SEI CERTIFIED)***

The CS-5020C Microwave Receiver is a high-performance, super-heterodyne, set-on and sweep receiver that converts signals in the frequency range of 0.5–18 GHz into IF outputs of 1.0 GHz (standard) and optional 70, 140, and 160 MHz (selectable) outputs. Video (AM/FM/LOG) and audio demodulated outputs are also available optionally. This receiver can be extended in frequency coverage to 0.1–22 GHz without the need for external extenders. A millimeter-wave downconverter interface also can be included internally, which allows the operator to attach a remote downconverter to provide further coverage in the millimeter-wave frequency range.

The CS-5020C can be configured for a wide variety of applications in COMINT or ELINT missions. The 1.0 GHz/500 MHz BW wideband IF output allows processing of various high data rate/high complexity signals. This receiver, combined with the available external millimeter-wave downconverters, provides for the search and collection of signals of interest in the microwave and millimeter-wave frequency bands from 100 MHz–110 GHz.

The CS-5020C receiver features outstanding performance, flexibility, and value in the multi-mission role. A high dynamic range with a typical noise figure of 13 dB, third-order intercept of +2 dBm, and 100 Hz tuning resolution makes the CS-5020C receiver capable of operating in demanding missions. The 70/140/160 MHz IF outputs can be provided with fixed gain or optional AGC/MGC control (Option 6a) and are normally upright, but can be inverted upon command. The receiver's RF/IF gain is microprocessor normalized to provide excellent flatness across the entire 0.1–22 GHz frequency range. The CS-5020C is fully synthesized with phase noise less than 0.65° RMS (0.5° typical), and is phase coherent to either an internal crystal oscillator or an external 10 MHz reference.

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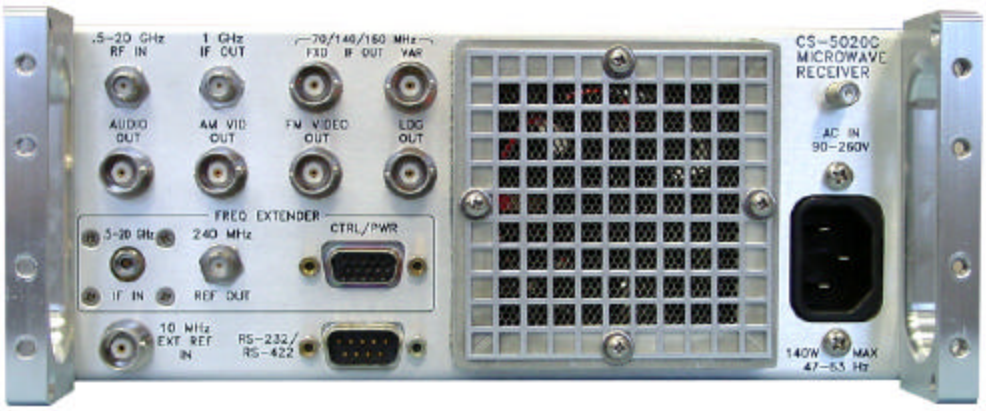
MECHANICAL

The CS-5020C is contained in a half-width, two-unit-high rack-mount package that uses forced air cooling for high operational reliability. The AC power input accepts 90–260 VAC, 47–400 Hz. The internal power supply has sufficient output for an optional external millimeter-wave downconverter and preamplifier. It is designed to meet the requirements of MIL-STD-461 and includes mechanical shielding techniques such as EMI gasketing and waveguide-beyond-cutoff hole patterns for cooling vents. (The rear panel view below may vary with the options installed.)

INTERFACE

A front panel is now a standard feature (still listed as Option 2a) with keypad plus optical encoder tuning in a user-friendly configuration. All control and monitoring functions are available locally via the front panel or remotely via either the standard RS-232/RS-422 or other optional digital interfaces (Option 3). Significant functions include 100 Hz display resolution, front panel "EXT REF" LED, ability to store and recall one hundred settings, BITE, sweep functions, frequency reference auto-update, and appropriate IF and demodulation functions.



OPTIONS

A number of options are available, as listed below. Consult with Communication Solutions (Com-Sol) for option compatibility.

Option 1 – IF Outputs

1a – 1 GHz/500 MHz BW IF output (standard)
1b – Adds an IF output with a selectable frequency/BW of 70/50, 140/85, and 160/85 MHz.
1c – Adds an IF output with a selectable frequency/BW of 70/50, 140/100, and 160/100 MHz.

Option 2 – Front Panel (now standard)

Option 3 – Digital Interfaces - Contact Com-Sol for others.

3a – IEEE-488
3b – Ethernet (10Base-T)
3c – RS-232 PC compatible
3d – RS-485

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Option 4 – LOG Amplifier (Option 1b or 1c required)

4a – Wideband LOG amplifier providing the ability to auto-stop and also to measure CW input signal level

4b – Same as 4a, adding pulse level measurement capability

Option 5 – Frequency Extension

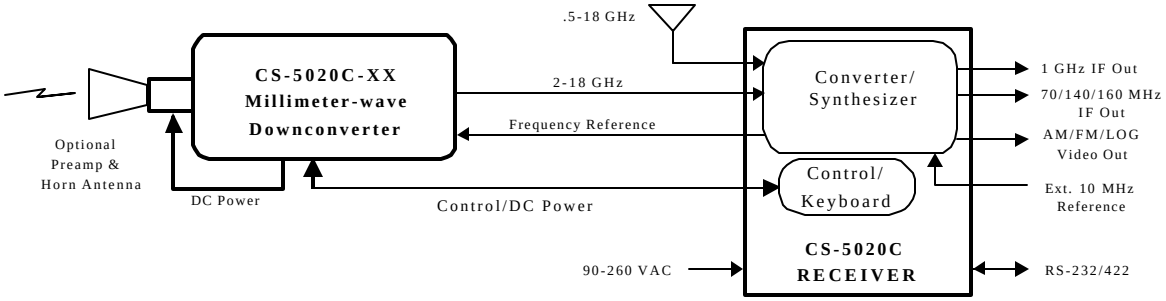
5a – N/A

5b – Extends the lower frequency range from 0.5 to 0.1 GHz. The 1 GHz IF bandwidth is limited to 85 MHz rather than 500 MHz for tuned frequencies below 500 MHz.

5c – Extends the upper frequency range from 18 to 20 GHz.

5d – Extends the upper frequency range from 18 to 22 GHz.

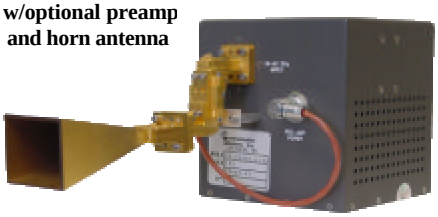
5e – Adds the interfaces to connect millimeter-wave downconverters. The diagram below shows a typical frequency extension configuration.



Simplified Block Diagram

Millimeter-wave downconverters are small modules that are connected to the CS-5020C via two coaxial cables and a control/power cable. This allows a downconverter to be located near the antenna, which avoids the use of longer cables or difficult waveguide runs that could degrade the signal. A preamplifier can be connected directly to the downconverter, with power routed through the downconverter from the receiver via an external power cable.

Millimeter-wave downconverter w/optional preamp and horn antenna



The CS-5020C uses direct frequency commanding for operation in the millimeter wave bands. For example, if the operator requires the tuner to be set to 39.7525 GHz, the direct frequency of 39.7525 GHz would be commanded to the tuner. Algorithm or look-up table conversions are not required to be performed by the operator for millimeter wave operation.

Option 6 – Variable Gain IF Output/AM Demodulation (Option 1b or 1c required)

6a – Adds a pre-detected IF at 70, 140, or 160 MHz, with manual (MGC) or automatic (AGC) gain control.

6b – Adds AM Video/Audio Demodulation to Option 6a. Video output has level control.

Option 7 – Additional IF Bandwidths/FM & LOG Demodulation (Option 1b or 1c required)

7a – Adds up to seven IF filters at the 70 MHz center frequency, typically ranging from 150 kHz to 40 MHz. Filters are available in either SAW or lumped-element topology.

7b – Adds up to seven IF filters at the 70 MHz center frequency, plus the FM and LOG demodulation. Filters and demodulators are packaged in a single, replaceable module. Provides FM & LOG video outputs, plus a level-controlled FM audio output.

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7c – Adds up to seven IF filters at the 160 MHz center frequency, typically ranging from 250 kHz to 50 MHz. Filters are available in either SAW or lumped-element topology. Not available with Option 7a.
7d – Same as 7b, but with filtering and demodulation at 160 MHz.

Option 8 – I/Q Outputs (Option 1b or 1c required) – Contact Com-Sol for others.
8a – 160 MHz IF center frequency

Option 9 – RF Input Blanking/Attenuator
9a – Two RF blanking inputs with polarity selection
9b – 70 dB RF attenuator, in 10 dB steps

Option 10 – Display Interface
10a – No longer available
10b – CS-5027 Display/Digitizer Interface that allows the unit to be connected to a CS-5027 Display/Digitizer to obtain swept and set-on spectral displays with markers and many other functions to help the operator identify signals.

Option 11 – COMINT/ELINT Filters
11a – ELINT operation: 1 GHz IF Gaussian filter replaces the standard Chebyshev filter.
11b – Includes both standard Chebyshev and Gaussian filters with software selection.

Option 12 - Extended Warranty – Contact Com-Sol for details.

RELATED EQUIPMENT

CS-5020C-XX Millimeter-wave Downconverters
CS-5027 Display/Digitizer
CS-1095 IF/Baseband Converter
CS-1024 IF/Baseband Converter

SPECIFICATIONS – CS-5020C MICROWAVE RECEIVER

Performance according to specifications is guaranteed over the stated operating temperature range unless otherwise noted.

Input Frequency	0.5–18 range (standard) 0.1–0.5 GHz Extension (Option 5b) 18–20 GHz Extension (Option 5c) 20–22 GHz Extension (Option 5d)
Maximum CW Input Signal Level.....	+20 dBm (no damage)
LO Re-Radiation	-95 dBm max (0.1–22 GHz)

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Noise Figure (at 25° C)	13 dB typical, 0.1–17 GHz 15 dB max to 18 GHz 16 dB max to 20 GHz 17 dB max to 22 GHz
Input 1 dB Compression	-15 dBm min
Input Third-Order Intercept (at 25° C)	+2 dBm typical 0 dBm min, 0.1–20 GHz -2 dBm min to 22 GHz
Image Rejection	70 dB min up to 18 GHz
IF Rejection	70 dB min
Internal Frequency Stability	
over temperature range	$\pm 3 \times 10^{-7}$ max
aging	5×10^{-9}/day after 15-minute warm-up
External Reference	
frequency	10 MHz
amplitude	0 ± 3 dBm, automatically switched
connector	BNC female
Tuning Modes	Continuous wave or sweep
Settling Time (after last command bit)	25 ms max
Tuning Resolution	100 Hz
Internally Generated Spurious	-100 dBm max equivalent input
Integrated Phase Noise (100 Hz–10 MHz)	0.5º RMS typical 0.65º RMS max

SSB Phase Noise

Freq Offset	Phase Noise (typical)
100 Hz	-65 dBc/Hz
1000 Hz	-72 dBc/Hz
10 kHz	-90 dBc/Hz
100 kHz	-102 dBc/Hz
1 MHz	-120 dBc/Hz
10 MHz	-130 dBc/Hz

IF Output Frequency/Bandwidth	1.0 GHz/500 MHz (standard) 1 GHz/85 MHz below 500 MHz input (Option 5b) 70/50, 140/85, 160/85 MHz (Option 1b) 70/50, 140/100, 160/100 MHz (Option 1c)
RF/IF Gain (70/140/160 MHz IF)	15 ± 2 dB min (fixed gain outputs) Non-inverted spectrum (all outputs)
RF/IF Gain Flatness	±1 dB max over the 0.1–20 GHz range

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Variable Gain IF Output (Option 6a)	
control	60 dB min
AGC	-10 dBm
MGC	1-dB steps
I/Q Outputs (Option 8a)	
RF/IQ gain	50 dB min
amplitude matching	±1 dB max
phase matching	±1.5° typical
bandwidth	40 MHz min (Option 8a)
output level	1 V p-p nominal (AGC mode)
phase adjustment range	30° min
MGC	50 dB min in 1 dB steps
Group Delay (1 GHz output)	3 ns max over 80% of the IF bandwidth
AM & FM Video Gain Control	10 to 100% in 10% steps (Options 6b, 7b)
AM Video Output	1.0 V peak with AGC selected (Option 6b)
FM Video Output	±1 V peak for two-thirds BW deviation (Option 7b)
IF Bandwidths	0.15–85 MHz, up to seven (Options 7a, 7c)
Audio Output Level (Options 6b, 7b, 7d)	
AM	0.5 VRMS
FM	1.0 VRMS into 600 ohms
Input VSWR (50 ohm system)	2.5:1 max
LOG Video Outputs	0 to 2 V nominal for 65 dB range (Option 7b or 7d)
Coaxial Connectors	
RF input	SMA female
Downconverter IF input	SMA female (Option 5e)
1 GHz IF output	SMA female
160/140/70 MHz IF output	BNC female
Video and I/Q outputs	BNC female
240 MHz reference output	SMA female (Option 5e)
Function Controls	Front panel and RS-232/422 (standard) IEEE-488 (Option 3a) Ethernet 10Base-T (Option 3b) RS-232 PC compatible (Option 3c) RS-485 (Option 3d)
BITE	Power supply voltages, temperature, phase-lock status, service hours, on/off cycles, PLL tuning voltages, software version, interface addresses
Temperature	
operating	0 to +50º C
storage	-40 to +85º C

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Cooling	Forced air
Humidity	20-95% non-condensing
Power	90–260 VAC, 47–400 Hz, 110 W nominal, varies w/options
Dimensions	3.5 x 8.5 x 21 in (8.9 x 21.6 x 53.3 cm), excludes handles and connectors
Weight	18 lb (8.2 kg) max
EMI Shielding	Designed to meet MIL-STD-461, RE-02, CS-03
International Standards	Designed for CE compliance

ORDERING INFORMATION

When placing an order, please specify the exact model and options. Each unit is supplied with a power cord, a manual, a certificate of conformance, and acceptance test data.

All exports of the hardware and/or software referenced in this datasheet require a United States Department of State Export License, or exemption as regulated by the International Traffic in Arms Regulations (ITAR).

WARRANTY

Communication Solutions is an ISO-9001 certified Engineering and Manufacturing facility serving the Signal Intelligence Community and the Test & Measurement Industry.

All units are warranted for a period of one year against manufacturing defects in materials or workmanship, provided that the unit is returned to the manufacturer's designated facility. This warranty is specifically limited to the repair or replacement of the unit, and does not include liability for consequential damages or physical damage caused by other parties.

Communication Solutions reserves the right to change the features and/or specifications of the equipment described in this document at any time without notice.

Com-Sol is ISO-9001 registered.

DFOISR Ref: 02-S-2299

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